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A study of oil-contaminated soil with the help of X-ray microtomography (model experiments)

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Abstract

© 2015, Pleiades Publishing, Ltd. The physical properties of a loamy gray forest soil have been studied using X-ray computer tomography in a column experiment with oil contamination and subsequent soil percolation with water. In the applied aspect, the laboratory contamination simulated the residual oil contamination of an air-dry arable soil. The gradations of gray color corresponding to different soil components were distinguished on the tomographic images; to judge about their nature, the control samples were used. The changes in pore space in the presence of water and oil were recorded both with the traditional methods and on the tomograms; these data were in good agreement. Oil on the tomograms had the same hues as sand, and soil aggregates had a greater density for the X-rays. The presence of oil increased the X-ray transparency of the samples in comparison with the control soil. The facts of apparent increase in size of sand and soil particles and accompanying soil cracking under the impact of oil and water were observed on the tomograms and in the course of sedimentation experiments. A compaction of soil aggregates was observed in the presence of both liquids. Combined action of water and oil during two days led to the superposition of their effects of the formation of large pores. After two weeks, the size of visible pores returned to the level of the control variant.

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Keywords

digital image analysis, gray forest soils, pore space